

REMARKS

In view of the following remarks, and the amendments made to the claims and drawings, reconsideration of the application is respectfully requested.

Applicant hereby acknowledges that the Examiner has examined claims 1-10 and 19-34 and furthermore has withdrawn claims 11-18 from further consideration pursuant to 37 C.F.R. 1.142(b).

The Applicant is grateful for the Examiner's acknowledgment of the paper submitted under 35 U.S.C. § 119 (a)-(d) and that they have been placed of record in the file.

The drawings have been objected to as failing to comply with 37 C.F.R. § 1.84 (p)(4) because reference character 23 has been used to designate different pipes in Figures 1 and 4. Additionally, the reference numeral 18 in Figure 1 was not mentioned in the description. In response, Applicant has provided a proposed amendment to the drawings marked-up in red wherein the indicated reference numerals 18 and 23 have been deleted from Figures 1 and 4 respectively.

Claims 1-10 and 19-34 have been rejected under 35 U.S.C. § 112 second paragraph as being indefinite for failing to particularly point out and distinctly claim subject matter which the Applicant has regards as the invention. With respect to claims 1-10 and 19-30 and 32-34, it is respectfully submitted that these rejections have been rendered moot due to the fact these claims have been canceled. With regards to claim 31, the claim has been amended to eliminate the phrase "adapted to". It should be noted in passing that the words "adapted to" have been accepted by the courts as being a definite and proper claim limitation. See for example, In RE Venezia 189 USPQ 149 (CCPA

1976) (copy enclosed) wherein the court referenced the claim language "a pair of sleeves . . . each sleeve of said pair *adapted to be fitted* over the insulating jacket of one of said cables" and commented "Rather than being a mere direction of activities to take place in the future, this language imparts a structural limitation to the sleeve". Nonetheless, in order to expedite prosecution, the phrase "adapted to" has been avoided where possible in the attached claims.

Claims 1-4, 9-10, 19-22, 25-26 and 28 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Eliasson et al., either German document 4 332 789 or Japanese document 07-149670. Applicant respectfully submits that this rejection has been rendered moot due to all these claims being canceled.

In addition, claims 1, 2, 4, 5, 7-10, 19-23, 25-26 and 29-32 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Yutaka et al. Japanese document 06-925736. Once again, with the exception of claim 31, all of these claims have been canceled and therefore, with regards to those claims, Applicant respectfully submits that the rejection is moot. However, with specific regard to claim 31, the Examiner has argued on page 11 of the Office Action that "Yutaka et al. disclose a system comprising:

An electrolyzer 7 for electrolyzing water to generate hydrogen;

A carbon dioxide source (reformer 2, combustor 3);

A first reactor 6 to generate a storage compound from hydrogen and carbon dioxide;

A store 8 for storing the storage compound;

A second reactor (reformer 2) for converting the storage compound back into hydrogen."

Applicant respectfully submits that the Yutaka et al. reference does not anticipate claim 31 as amended. Initially, according to the Examiner, storage unit 8 in Yutaka is used for storage of methanol. Applicant respectfully disagrees. Unit 8 is clearly referred

to as a hydrogen storage unit and there is no reference anywhere in Yutaka to the re-conversion of methanol into hydrogen and carbon dioxide. While reference is made to the combustion of methanol, combustion of methanol produces water and carbon dioxide and not hydrogen and carbon dioxide as required by the present invention. Therefore, Applicant respectfully submits that the Yutaka et al. reference does not anticipate the claim as amended.

Claims 1-3, 9-10, 19-21, 25-26 and 28 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Kobayashi et al. European Reference 0539244. Applicant respectfully submits that this rejection is moot due to the fact that these claims have been canceled.

Claims 5, 7, 8, 23 and 29-32 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Eliasson et al. (German Reference 4 332 789 or JP 07-149670) in view of Kumar et al. U.S. Patent No. 5,248,566. Once again, all claims have been canceled with the exception of claim 31 and therefore, with regards to those claims, the rejection has been rendered moot.

With specific reference to the rejection on claim 31, the Examiner has argued that Eliasson et al. discloses a system comprising:

"An electrolyzer 3 adapted to electrolyze water to generate hydrogen;

A carbon dioxide source 5, 6, 6a;

A first reactor 4 connected to the electrolyzer 3 and the carbon dioxide source 5, 6, 6a, adapted to receive hydrogen from the electrolyzer 3 to react with carbon dioxide to form a storage compound (FIG. 1, CH₃OH); and

A store 7 connected to the reactor 4 and adapted to store the storage compound."

The Examiner then relies on Kumar et al. to teach a power generation system and states that it would be obvious to one of ordinary skill in the art at the time the invention

was made to add a second reactor to the apparatus of Eliasson et al. because the second reactor allows a storage compound to be used for fueling hydrogen consumable devices and enables a conversion of the storage compound into hydrogen only when demanded by the device.


Applicant respectfully submits that Eliasson et al. discloses an electrolyzes means connected to supplies of water and electricity for generating hydrogen from water, and first reaction means for reacting the hydrogen with carbon dioxide to produce methanol. The reference also discloses that methanol may be stored in a tank and then supplied to customers as required. However, Eliasson et al., does not disclose **a second reactor whereby the methanol is converted back into hydrogen and carbon dioxide and where the carbon dioxide is recycled back to the first reactor for the production of further methanol**. In Figure 1, the reference numeral 8 of Eliasson et al. refers to a consumer such as a vehicle or power station. Furthermore, paragraph 4 of Eliasson refers to the compound, such as methanol, being used as a fuel for vehicles or combustion plants. Eliasson et al. is therefore teaching that methanol is used directly as a fuel and there is no suggesting that it would be converted back into hydrogen and carbon dioxide so that the hydrogen may be used. Furthermore, there is no suggestion that carbon dioxide is so produced to be recycled for use in the production of further methanol. Indeed the carbon dioxide used in Eliasson et al. for the synthesis of methanol is extracted from exhaust gases of fossil fuel heated power stations.

Kumar et al. discloses the partial oxidation of, among other things, methanol to produce hydrogen contained in a gas which is used in a fuel cell. However, Kumar et al. makes no reference to the separation of any carbon dioxide and the recycling of carbon dioxide to produce further methanol. Indeed, Kumar et al. specifically refers to the methanol as being manufactured from coal or natural gas. See column 2, lines 38-40. The document makes no mention whatsoever of methanol produced by reacting hydrogen and carbon dioxide wherein the hydrogen is produced from the electrolysis of water and

the carbon dioxide is recycled when the methanol is converted back into hydrogen and carbon dioxide. There is simply no motivation to combine the teachings of Eliasson et al. with that of Kumar et al. as suggested by the Examiner and, even if combined, the combination fails to address the limitations now recited in claim 31. Specifically, there is no teaching in either reference that the carbon dioxide produced when methanol is converted back into hydrogen and that carbon dioxide should be recycled for the use of further production of methanol.

For the foregoing reasons, and the amendments made to the claims and drawings, it is respectfully requested that the claims be allowed and the application passed to issue. If the Examiner should have any additional questions or concerns regarding the allowance of this application, he is cordially invited to contact the undersigned at the number provided if it would expedite the prosecution.

Respectfully submitted,



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1. (Once Amended) A system for the production and storage of hydrogen, said system comprising:

an electrolyzer adapted to [electrolyze] be connected to supplies of water and electricity and operable to provide electrolysis of water to generate hydrogen;

[a carbon dioxide source;]

a first reactor connected to the electrolyzer [and the carbon dioxide source, the first reactor being adapted] to receive hydrogen from [generated by] the electrolyzer and to react the hydrogen with carbon dioxide to form methanol, the first reactor being adapted to react hydrogen with carbon dioxide to form a storage compound];

a [store] storage unit connected to the first reactor for storing of said methanol; [and adapted to store the storage compound; and]

a second reactor [adapted to receive the storage compound from the store and adapted to convert the storage compound back into hydrogen] connected to said storage unit to receive the methanol from the storage unit and to convert the methanol back into hydrogen and carbon dioxide; and

means for recycling the carbon dioxide produced in the second reactor to the first reactor.